



US006384402B1

(12) **United States Patent**  
**Hair, III et al.**

(10) **Patent No.:** **US 6,384,402 B1**  
**(45) Date of Patent:** **\*May 7, 2002**

(54) **OPTICAL VEND-SENSING SYSTEM FOR CONTROL OF VENDING MACHINE**

(75) **Inventors:** **James M. Hair, III**, Cheyenne, WY (US); **Kyriakos P. Spentzos**, Santa Rosa, CA (US)

(73) **Assignee:** **Automated Merchandising Systems**, Kearneysville, WV (US)

(\*) **Notice:** This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

5,111,962 A	5/1992	Oden	221/1
5,201,429 A	4/1993	Hikosaka et al.	211/59.2
5,207,784 A	5/1993	Schartzendruber	221/6
5,229,749 A	7/1993	Yenglin	340/568.8
5,238,145 A	8/1993	Pippin	221/260
5,273,183 A	12/1993	Tuttobene	221/7
5,280,845 A	1/1994	Leight	221/2
5,344,043 A	9/1994	Moulding et al.	221/71
5,346,466 A	9/1994	Yerlikaya et al.	604/253
5,490,610 A	2/1996	Pearson	221/2
5,625,198 A *	4/1997	Chigira	250/559.29
5,651,479 A *	7/1997	Percy et al.	221/131
5,813,568 A	9/1998	Lowling	221/6
5,847,389 A	12/1998	Mertins et al.	250/222.2
5,884,806 A	3/1999	Boyer et al.	221/75
5,927,539 A *	7/1999	Truitt et al.	221/194
5,992,030 A	7/1999	Shank et al.	42/144
6,064,921 A	5/2000	Pippin et al.	700/242

#### FOREIGN PATENT DOCUMENTS

EP	432996	6/1991
JP	2-257386	* 12/1997
JP	9-326075	* 12/1997

#### OTHER PUBLICATIONS

Nais Sensors Brochure, Aromat Corporation, XPE 001 30M1296, 1996, p. 47.  
 SUNX Catalog; 1996, pp. 28-29.

\* cited by examiner

*Primary Examiner*—Georgia Epps

*Assistant Examiner*—Evelyn A. Lester

(74) *Attorney, Agent, or Firm*—Pillsbury Winthrop LLP

(57) **ABSTRACT**

For ensuring that a vending machine motor will continue to operate until a product has descended through a vending space or an established time interval has elapsed, an optical beam is established across the vend space through which a product must drop. A change in beam intensity is detected. By preference infra red light is emitted at one focal point of an elliptical reflector, and detected at the other focal point. The light is emitted in pulses in the preferred embodiment, and the optical sensing system has automated calibration and error detecting functions.

**51 Claims, 16 Drawing Sheets**

(21) **Appl. No.:** **09/261,221**

(22) **Filed:** **Mar. 3, 1999**

#### Related U.S. Application Data

(60) Provisional application No. 60/083,522, filed on Apr. 29, 1998.

(51) **Int. Cl.**<sup>7</sup> ..... **G01N 9/04**; **H01J 3/14**;  
**G06M 7/00**; **G07F 11/00**

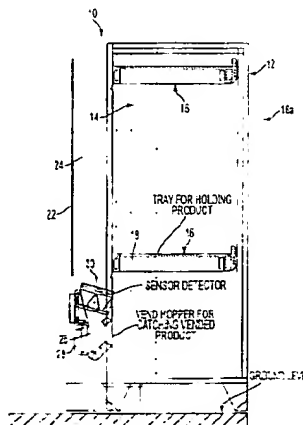
(52) **U.S. Cl.** ..... **250/223 R**; **250/216**; **250/221**;  
**221/194**; **364/479.01**

(58) **Field of Search** ..... **250/216**, **221**,  
**250/223 R**; **221/194**; **364/479.01**

(56) **References Cited**

#### U.S. PATENT DOCUMENTS

4,252,250 A	2/1981	Toth	221/13
4,359,147 A	11/1982	Levasseur	194/200
4,412,607 A	11/1983	Collins et al.	194/216
4,494,675 A	1/1985	Stutsman	221/13
4,573,606 A	3/1986	Lewis et al.	221/2
4,776,487 A	10/1988	Kurosawa et al.	221/2
4,869,392 A	9/1989	Moulding et al.	221/1
4,871,054 A	10/1989	Murray	194/212





US006202888B1

(12) **United States Patent**  
Pollock et al.

(10) Patent No.: **US 6,202,888 B1**  
(45) Date of Patent: **Mar. 20, 2001**

(54) **SYSTEM AND METHOD FOR PERFORMING VEND OPERATION**

FOREIGN PATENT DOCUMENTS

3-81895 4/1991 (JP).

(75) Inventors: **Richard A. Pollock; Roy S. Steeley,**  
both of Charles Town, WV (US);  
**Kyriakos Spentzos,** Santa Rosa, CA  
(US)

\* cited by examiner

(73) Assignee: **Automated Merchandising Systems,**  
Inc., Kearneysville, WV (US)

*Primary Examiner*—Kenneth W. Noland

(74) *Attorney, Agent, or Firm*—Pillsbury Winthrop LLP

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(57) **ABSTRACT**

A method and system are provided for performing vend operations on articles selected by a purchaser. Articles to be dispensed are stored in a storage section, and purchased articles are transferred from the storage section to a vend section. A vend mechanism is provided for rapidly moving a given article from a vend-destined section to the vend section. A helical transfer member holds the articles in the storage section and is rotatable in a dispensing direction to transfer the given article from a position adjacent the vend-destined section to the vend-destined section. The helical transfer member is also rotatable in a reverse direction opposite the dispensing direction. A driver is coupled to each helical transfer member, and is actuable to rotate the helical transfer member in either the dispensing direction or the reverse direction. A controller is operable during each vend operation to control the driver to first rotate the helical transfer member in the dispensing direction by a first amount until the given article is fully transferred to the vend-destined section. The controller then controls the driver to then rotate the helical transfer member in the reverse direction by a second amount until an article immediately following the given article is securely held in the storage section.

(21) Appl. No.: **09/340,048**

(22) Filed: **Jun. 28, 1999**

(51) Int. Cl.<sup>7</sup> ..... **B65G 59/00**

(52) U.S. Cl. .... **221/1; 221/75**

(58) Field of Search ..... **221/1, 75, 7, 9,**  
**221/15, 88, 277, 195, 196, 289**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,023,704	5/1977	Pitel et al. .	
4,045,626	8/1977	Holper .	
4,355,733	10/1982	Schoenkopf et al. .	
4,492,979	1/1985	Linstromberg et al. .	
4,560,088	12/1985	Tan .	
4,638,922	1/1987	Stoltz .	
4,942,979 *	7/1990	Linstromberg et al. ....	221/75
5,303,844	4/1994	Muehlberger .	
5,553,736	9/1996	Healis .	
6,041,962	3/2000	Pollock .	

**36 Claims, 10 Drawing Sheets**

